

Original Research Article

Electrocardiography in post hemodialysed chronic kidney disease patients

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ABSTRACT

Background: Chronic kidney disease (CKD) is associated with higher risk of cardiovascular events and Electrocardiographic changes are common in CKD patients. Electrocardiography (ECG) is cheap and easily available investigation that could pick up abnormalities of heart. Our study focuses on electrocardiographic changes seen within 24 hours in post hemodialysis CKD patients.

Methods: It is a cross sectional, observational study of 298 CKD patients who underwent hemodialysis at tertiary care facility of VIMSAR, Burla during the period between November 2018 to November 2020. 12 leads ECG of these patients were taken post hemodialysis and abnormalities were interpreted.

Results: Total number of patients included in the study were 298 with mean age distribution of 47±8.4 years. Mean Serum urea level was 126 mg/dl. Creatinine levels ranged between 5-10 mg/dl. Left ventricular hypertrophy (LVH) and left atrial enlargement (LAE) were seen in 14.76% and 8.3% of patients respectively. Atrial fibrillation was present in 4.3% of patients. Left axis deviation (LAD 7%), right axis deviation (RAD 6%), atrial ectopics (2.6%) and tall T waves (7.3%) were the other ECG changes observed.

Conclusions: ECG changes are common in CKD patients in post hemodialysis state, so it becomes important to monitor these changes in these patients for early detection of any cardiac abnormalities.

Keywords: Chronic kidney disease, ECG, Hemodialysis, Left ventricular hypertrophy

INTRODUCTION

The prevalence of chronic kidney disease (CKD) is continuing to increase worldwide as does the prevalence of end stage renal disease. Cardiovascular disease is the leading cause of morbidity and mortality in patient at every stage of chronic kidney disease.¹ Joint National Committee-7 (JNC-7) report has recognized CKD as an independent cardiovascular risk state.^{2,3} Sudden death is a leading cause of death in patients requiring hemodialysis, with 27% of all deaths attributable to arrhythmic mechanism.^{4,5} Cardiac arrest occurs at a rate of 7 per 100,000 hemodialysis sessions and is more common in the elderly, patients with diabetes and patients using central venous catheter.⁶

Electrocardiography (ECG) is a cheap and easily available essential tool for evaluation of cardiac disease. ECG can detect abnormalities in cardiac rhythm, alterations in cardiac anatomy and myocardial ischaemia. ECG changes in CKD patients are common and they can predict future cardiovascular events in these patients.^{7,8} Although studies on ECG changes in CKD patients been done before, they mainly focused on ECG changes present during hemodialysis or prior to hemodialysis. CKD patients post hemodialysis are vulnerable to medical emergencies including sudden cardiac death as their internal milieu undergoes drastic changes like electrolyte disturbances, blood pressure etc. which makes them a highly vulnerable group. So monitoring of post hemodialysis CKD patients becomes very important. Our studies tries to focus on ECG

changes in post hemodialysis CKD patients during first 24 hours post dialysis in order to observe cardiac abnormalities seen in these patients.

Objectives

Objectives of the study was to observe the various electrocardiographic abnormalities in post haemodialysed CKD patients.

METHODS

Study design

This observational study was conducted in inpatient department of general medicine, VIMSAR, Burla on the patient of CKD who underwent hemodialysis during the period of November 2018 to November 2020.

Sample size

The study consisted of 298 cases.

Inclusion criteria

Patients with age >20 years and <80years; serum creatinine >1.2 mg/dl; glomerular filtration rate (GFR) <90 ml/min per 1.73 m² BSA; and renal ultrasonography showing feature of MRD (CKD) were included in the study.

Exclusion criteria

Patients with documented heart diseases were excluded from the study.

Procedure

Post-hemodialysis blood samples were collected from all the patients for routine investigations and a 12 lead ECG with rhythm strip was done for every patient within 24 hours of hemodialysis.

Statistical analysis

The data were analysed using statistical package for the social sciences (SPSS) software.

Sample size

Total 298 cases of post hemodialysis CKD patient were taken in this study. The diagnosis of CKD was done by clinical and laboratory evaluation and ultrasonography of kidney.

Ethical approval

Approved by Institutional Ethical Committee, VIMSAR, Burla (Regd. No. ECR/861/Inst./OR/2016),

communication of VIREC decision No. 007/19-I-S-008/Dt.25/1/19.

RESULTS

In our study out of 298 patients, male were affected almost 2.5 times more than female. It seems chronic kidney disease is male dominated. In our study 71.8% of patients were male and 28.1% were female (Table 1).

Table 1: Sex wise distribution of population.

Sex	Number	Percentage
Male	214	71.8
Female	84	28.2

Age distribution of our study population ranged from 27 years to 72 years, with mean age of 47 years. Most patients affected belonged to 5th decade followed by 6th decade (Table 2).

Table 2: Age distribution of study population.

Age group	Number	Percentage
20-30	4	1.3
31-40	28	9.39
41-50	114	38.25
51-60	58	19.46
61-70	9	3.02
71-80	1	0.03

The level of serum urea ranged from 54 to 312 mg/dl, with mean value of 126 mg/dl. The post dialysis creatinine level in maximum study population ranged between 5 to 10 mg/dl.

In the observed population, through ultrasonography (USG) abdomen and pelvis, it was found that 75% were having grade 3 bilateral MRD, followed by grade 2 bilateral MRD in 21.8% patients. This observation is of pre hemodialysis. The study population needed renal replacement therapy to sustain life. 74% of the patients had calculated eGFR of less than 15.

In our study, post hemodialysis, 98% of patients had normal heart rate. Only 2% (n=7) had bradycardia and none had tachycardia.

Atrial fibrillation was observed in 4.3% (n=13) of study population and rest 95.7% had normal rhythm. In this study LAD was observed in 7% (n=21) of patients and RAD was observed in 6% of patients (n=19). LAE and LVH were seen in 8.3% (n=25) and 14.76% (n=44) of patients respectively. Electrocardiographic wave pattern abnormalities were observed in the study population with LVH with strain being the most common abnormality observed in 9.7% of the population while tall T waves were observed 7.3% (n=22) of patients.

Table 3: ECG changes and their frequencies in the study population.

ECG changes	Frequency %
Heart rate	
Normal	98
Bradycardia	2 (n=7)
Tachycardia	0
Rhythm	
Sinus rhythm	95.7
Atrial fibrillation	4.3
Mean electrical axis	
Left axis deviation	7 (n=21)
Right axis deviation	6 (n=19)
Heart chamber abnormalities	
Left ventricular hypertrophy	14.76 (n=44)
Left atrial enlargement	8.3 (n=25)
ECG wave changes	
LVH with strain	9.7
Tall T wave	7.3 (n=22)

DISCUSSION

Our study showed that ECG abnormalities are common in patient with CKD post hemodialysis with LVH being the most common abnormality, seen in 14.76% of the study population which is less than the findings of Bignotto et al (40%) and Stewart et al (39%).^{9,10} Other studies have shown much higher prevalence of LVH in CKD patients (66%), but this could be due to differences in composition of study population.¹¹ ECG finding of LVH is significant as it is associated with adverse cardiac events. LVH with strain pattern was found in 9.7% of study population. Strain pattern in ECG is associated with higher risk of sudden cardiac death than the one without it.^{12,13}

Atrial fibrillation was seen in 4.3% of our study population which is comparatively less than what Goldstein et al (11-16%) and Wetmore et al (9.9%) found but comparable to Bignotto et al (4.44%).^{14,15} This could be due to younger study population in our study as it is known that incidence of atrial fibrillation increases with age in CKD patients.¹⁶

Electrical axis deviation in ECG are subtle indicator cardiovascular changes in a patient, in our study we found left axis deviation in 7% of the population whereas Sachdeva et al showed LAD in 15% of their study population.¹⁷

Tall T wave is a marker of hyperkalemia, which is a common electrolyte abnormality seen in CKD patients which our study also confirms with finding of tall T waves in 7.3% of the patients. All these ECG changes could be due to changes happening in electrolytes composition of blood following hemodialysis. Hence, in addition to ECG monitoring, monitoring of electrolyte levels in post hemodialysis CKD patients becomes very important.

Limitations

We could not compare the pre hemodialysis ECG with that of post hemodialysis ECG which could have given more information regarding any change in ECG parameter due to hemodialysis. Again ECG changes in relation to various electrolytes could not be related which could have provided additional information.

CONCLUSION

Cardiovascular disease continues to be the leading cause of mortality including sudden cardiac deaths due to ventricular arrhythmias in CKD patients undergoing hemodialysis. Current study shows that there are significant electrocardiographic changes present in CKD patients post hemodialysis which could be a pointer toward the future cardiovascular events. Therefore ECG should be meticulously monitored in post hemodialysis patients. However larger studies may highlight further knowledge to the existing information and better patient care.

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